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DETERMINATION OF AEROSOL CONTENT  
IN THE ATMOSPHERE FROM  
ERTS-1 DATA

(E73-10295) DETERMINATION OF AEROSOL  
CONTENT IN THE ATMOSPHERE FROM ERTS-1  
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Progress Report No. 3

Contract No.: NAS5-21860

Period Covered: 7 January 1972 to 6 March 1973

Proposal Number: 245

GSFC ID Number: P135

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Prepared for:

Goddard Space Flight Center

7 March 1973

## ACCOMPLISHMENTS

During the third two-month period of this contract, the preliminary data analysis was continued, and a Data Analysis Plan (DAP) was submitted. The DAP was approved in early February, so that Phase III, Continuing Analysis, is now in effect. Ground-truth measurements were made at both test sites, including a NASA aircraft overflight at the Salton Sea/desert test site.

## GROUND-TRUTH MEASUREMENTS

The NASA aircraft overflight at the Salton Sea/desert test site took place on February 4, 1973. Unfortunately, there was considerable cloud cover at the time of the satellite overpass, and in addition, the aircraft MSS failed after the aircraft had completed five of the planned thirteen flight lines covering the target area. Most of the aircraft data were obtained over the water surface, with only a small amount over the desert. The preliminary photographic aircraft MSS data from one channel are expected from Houston this month. After examination of these data, we will request the digital tapes of the aircraft data considered suitable for analysis of the surface radiances.

Ground-based observations of the aerosol optical thickness at the Salton Sea were made at the time of the aircraft and satellite overpasses. Unfortunately, there was considerable cloud cover throughout the morning, and the sun was apparently clear from cirrus and low-level cloud for only the five minutes preceding the satellite overpass at 9:49 PST. The Volz photometer measurement of the aerosol thickness at this time is shown in Fig. 1 with previous Volz data.

As reported previously, the Exotech radiometer did not function correctly when pointed at the sun. A study of the problem suggested that this was due to a lack of baffles between the lenses and the detectors, so that the instrument was measuring too much scattered sky radiation. Exotech had independently found the same problem and solution, and shipped a replacement radiometer, with baffles, to us. Preliminary tests with this model suggest that it is functioning correctly.

## DATA ANALYSIS

### Software Development

The program has been successfully tested to read the CCT on a CDC 6400, and is now being extended to read data from the tape in prescribed geographical areas.

### Photographic Data Analysis

The data for 12-12-72, for which we have ground-truth Volz data, at the Salton Sea was received and analyzed. Unfortunately, there appears to be a problem in the calibration, at least at the low radiance end of the grey scale. The density of the transparency for the Salton Sea is greater than that of the blackest step in the grey scale, which corresponds to zero radiance.

A similar problem was found with the first data received for our San Diego test site (11-25-72). This problem has not arisen in the previous analyses since the density of the transparency has always been less than the blackest step on the grey scale. It is planned to further analyze these data when the digital data are received.

### Future Plans

In the next reporting period it is planned to analyze the digital data to investigate both the contrast and radiance relationships. The data from the NASA aircraft overflight will be analyzed.

### Significant Results

There are no significant results to report in this period.

### Problems

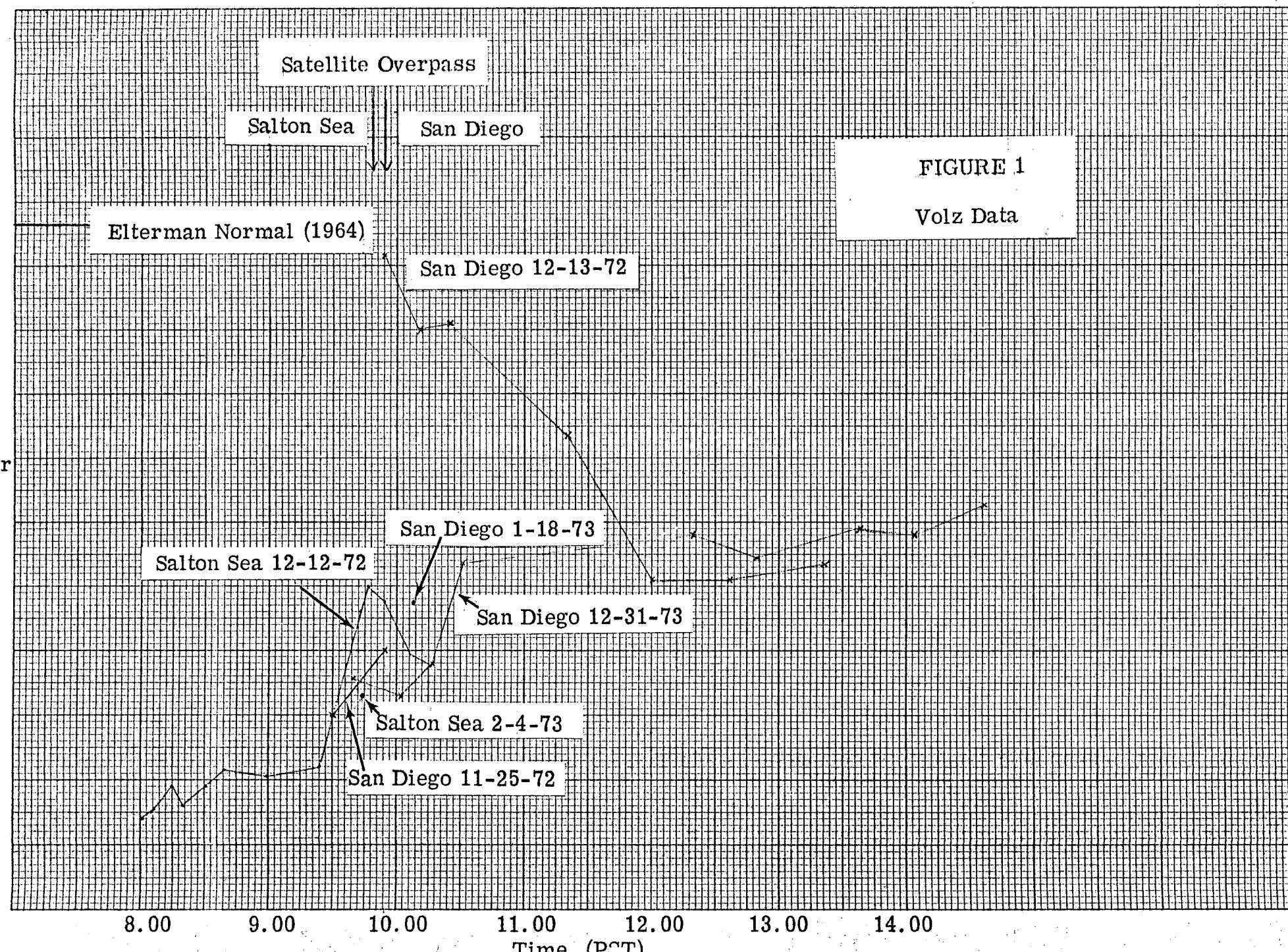
We have received duplicates of four sets of data, and triplicates of one set.

### Data Requests

Digital data for six sets of data (three at San Diego and three at the Salton Sea) have been requested. In addition, two missing transparencies for 8-26-72 were requested. A copy of the Data Request Form is included at the end of this report.

### Presentation

A paper, "Determination of Aerosol Content in the Atmosphere", discussing the results of this study will be presented at the ERTS-1 Symposium at GSFC in March. A copy of the abstract is included at the end of this report.



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## DATA REQUEST FORM

1. DATE Feb 13 19735. TELEPHONE NO. (714) 459-0211

NEW

2. USER ID PR 135

## 6. CATALOGUES DESIRED

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4. SHIP TO:

ADDRESS Dr. C.B. LUDWIG   
SCIENCE APPLICATIONS INC  
NEW  
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LA JOLLA, CA 92037

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## DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE

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The objective of this investigation is to demonstrate the feasibility of determining the aerosol content in the atmosphere from contrast measurements of ground features, and from radiance measurements. Theoretical relationships between aerosol content and contrast reduction and radiance have been derived for ideal model atmospheres. Satellite monitoring of the atmospheric aerosol content will provide information important in predicting the effect of man's activities on climate, and in correcting observations of surface features for the effects of the atmosphere.

The preliminary data analysis of the MSS transparencies has shown promising results for the contrast-aerosol content relationship in the Salton Sea/desert region. Results of ground-truth measurements of target inherent contrast with the NASA aircraft, and of the aerosol content made with a Volz photometer, will be presented. It is planned to present some results of the radiance-aerosol content relationship based on analysis of the digital tapes of the MSS data.